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BENEFICIATION OF A SAMPLE OF NEPHELINE SYENITE FROM BRITISH COLUMBIA AS SOURCE MATERIAL FOR THE GLASS INDUSTRY

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BENEFICIATION OF A SAMPLE OF NEPHELINE SYENITE FROM BRITISH COLUMBIA AS SOURCE MATERIAL FOR THE GLASS INDUSTRY

by

P.R.A. Andrews*

SUMMARY

A sample of nepheline syenite from the Ossoyos region of the Okanagan Valley in southern British Columbia was beneficiated by both screening and high intensity magnetic separation in an attempt to produce a glass-grade product, that is, a product containing 23.8% Al_2O_3 and less than 0.10% Fe_2O_3. The best results were obtained with the -420 + 100 µm fraction where, after magnetic separation, a non-magnetic product analysing 0.44% Fe_2O_3 and 20.2% Al_2O_3 was obtained. Recovery at 27.8%, was low.

The iron content of the resulting product, at 0.44% Fe_2O_3 would render this material unsuitable for use in clear glass production although it conceivably would be acceptable for amber glass and for use in the production of mineral fillers for fibreglass and foamglass.

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ENRICHISSEMENT D'UN ÉCHANTILLON DE SYÉNITE À NÉPHÉLINE PROVENANT DE LA COLOMBIE-BRITANNIQUE, POUR SERVIR DE MATÉRIAUX DE BASE À L'INDUSTRIE DU VERRE

par

P.R.A. Andrews*

RÉSUMÉ

Un échantillon de syénite à néphéline provenant de la région d'Ossoyos dans la Vallée de l'Okanagan au sud de la Colombie-Britannique a été enrichi à l'aide des méthodes de criblage et de séparation magnétique à haute intensité, dans le but de produire un produit de verre de qualité, c'est-à-dire un produit contenant 23,8 % Al_2O_3 et moins de 0,10 % Fe_2O_3. Les meilleurs résultats ont été obtenus avec la fraction -420 + 100 µm où, après séparation magnétique, un produit non magnétique de 0,44 % Fe_2O_3 et de 20,2 % Al_2O_3 a été obtenu. Une récupération de 27,8 % était basse.

La teneur en fer de 0,44 % Fe_2O_3 du produit obtenu rendrait ce matériau inadéquat à la production de verre transparent; il pourrait, cependant, être acceptable pour servir à la production de verre ambre et à la production de farine minérale utilisée dans la fabrication de fibre de verre et de verre mousse.

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INTRODUCTION

In November 1985, D. Constable of Raretech Ltd., delivered a sample of nepheline syenite which originated from the Ossoyos region of the Okanagan Valley in southern British Columbia, for evaluation as source material for the glass industry.

SAMPLE DESCRIPTION

The sample, weighing approximately 10 kg, consisted of six large, -100 mm lumps of nepheline syenite containing ~10% Fe_2O_3 as magnetite.

SAMPLE PREPARATION

The sample was crushed in a jaw crusher to less than 6 mm; to 2 mm by a cone crusher; and to 840 µm by a roll crusher. The -840 µm roll crusher product was dry screened at 100 µm to separate and discard the -100 µm fines which would be detrimental to magnetic separation.

PROCESSING

Following removal of the fines, the remaining portion of the sample was passed through an Exolon high intensity magnetic separator to separate the magnetite. The magnetics, middlings and non-magnetic products were analysed for Fe_2O_3 and Al_2O_3 and the results reported in Table 1. Visual examination of the products from magnetic separation indicated that the magnetite tended to concentrate in the +420 µm size range.

The products from Test 1 were recombined and sized at 420 µm to produce two sized fractions -840 + 420 µm and -420 + 100 µm. Each fraction was again passed through the Exolon separator and the products from magnetic separation analysed for Fe_2O_3 and Al_2O_3. The results of these tests (Tests 2 and 3) are also reported in Table 1.

RESULTS

The results in Table 1 indicate that the highest grade product was obtained using -420 + 100 µm material. Analyses of 20.2% Al_2O_3 and 0.44% Fe_2O_3 were obtained for the non-magnetic fraction of Test 3. Recovery was low at 27.8% (7.0% weight of 25.3% weight). This recovery value is based on the assumption that all of the -840 + 420 µm would, when ground, become -420 + 100 µm. Some portion, however, would be lost as -100 µm fines.

CONCLUSIONS

While 0.44% Fe_2O_3 is too high for the specialized markets, glass and ceramic grade nepheline syenite, the beneficiated material could be considered for amber grade which requires only 0.4% Fe_2O_3. Amber grade nepheline syenite is used as a filler/extender in the production of fibreglass and foamglass.

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TABLE 1. Magnetic separation results

Products	Test No.	Weight %	Analysis		Distribution	
			Fe_2O_3	Al_2O_3	Fe_2O_3	Al_2O_3
-840 + 100 µm	1					
Magnetics		5.4	12.0	14.7	13.4	4.3
Middlings		37.1	5.10	18.2	39.1	36.8
Non-magnetics		39.8	3.41	19.1	28.1	41.5
		82.3	(4.73)	(18.4)	80.6	82.6
- 100 µm		17.7	5.29	18.0	19.4	17.4
Calculated Head		100.0	4.83	18.3	100.0	100.0
-840 + 420 µm	2					
Magnetics		1.3	12.5	14.6	2.7	1.1
Middlings		18.9	9.91	14.9	30.7	16.1
Non-magnetics		36.8	7.0	17.4	42.2	36.5
		57.0	(8.09)	(16.5)	(75.6)	(53.7)
-420 + 100 µm	3					
Magnetics		4.8	3.98	18.8	2.8	5.2
Middlings		13.5	3.49	19.0	7.1	14.7
Non-magnetics		7.0	0.44	20.2	0.5	8.1
		25.3	(2.74)	(19.3)	(10.4)	(28.0)
- 100 µm		17.7	5.29	18.0	14.0	18.3
Calculated Head		100.0	6.70	17.4	100.0	100.0